The Results Of Preliminary Studies And The Choice Of The Direction Of Research To Improve The UXK Unit For Cleaning Raw Cotton From Machine Collection

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Abstract. The article presents the results of an analytical review of the state of existing raw cotton cleaning technologies and equipment, the results of preliminary studies to determine the quality of machine-picked cotton and the quality of machine-picked cotton cleaning of the existing UXK unit in order to choose the direction of further research on improving the UXK unit.

Keywords: unit, cleaning, improvement, technology, machine, cleaning, clogging, resource-saving

Annotasiya. Maqolada paxta xom ashyosini tozalashning mavjud texnologiyasi va texnikasini holatini tahlil qilish natijalari, UXK agregatini takomillashtirish bo'yicha keyingi tadqiqotlar yo'nalishini tanlash maqsadida mashinada paxta yig'ish sifati va mavjud UXK agregatini paxta tozalash sifatini aniqlash bo'yicha dastlabki tadqiqotlar natijalari keltirilgan.
Kalit so'zlar: agregat, tozalash, takomillashtirish, texnologiya, mashinada, tozalash, ifloslik, resurslarni tejash.

Аннотация. В статье приводится результаты аналитического обзора состояния существующих технологией очистки хлопка-сырца и техники, результаты предварительных исследований по определению качества хлопка машинного сбора и качества очистки хлопка машинного сбора существующего агрегата УХК с целью выбора направления дальнейших исследований по усовершенствованию агрегата УХК.
Ключевые слова: агрегат, очистка, совершенствование, технология, машинная, уборка, засоренность, ресурсосберегающих.

Introduction. The world community recognizes that today Uzbekistan is implementing comprehensive measures aimed at creating conditions for a radical increase in the efficiency of the cotton industry [1; - p.1]. Reforms are being successfully carried out to improve the technique and technologies for processing raw cotton and cotton seeds, including by attracting foreign direct investment.

In the main cotton producing countries in the world, including the United States, China, India, Pakistan and other countries, extensive research is being carried out to solve existing technological problems associated with drying, refining and ginning cotton, creating new generation technological equipment with high efficiency. In particular, high-performance, energy-saving technologies are being developed that preserve the natural quality indicators of fiber and new equipment for cleaning cotton from weeds.

The large-scale introduction of new economic systems in the republic, in particular the creation of cotton-textile clusters, sets a number of requirements for ginning enterprises that produce cotton fiber, such as flexibility in production management, efficiency, rational use of resources and maximum preservation of natural quality indicators of cotton fiber during its processing ... This confirms the urgent need to improve the quality and reduce the cost of fiber, which can only be achieved through the development of resource-saving, modern technologies and techniques, taking into account the achievements and experience of cotton-producing countries. In this regard, in the cotton ginning industry of the republic, a special place is occupied by research on the creation, improvement and implementation of efficient energy and resource-saving technologies for the primary processing of raw cotton. In particular, these are: the creation of an automated control system for the frequency of cleaning raw cotton from weeds, innovative research and development of new methods and directions of cleaning technology, including technological flow lines for cleaning raw cotton [2].

With the predominant transition in the republic to machine picking of raw cotton, special requirements are imposed on the quality of its cleaning. By 2026, Uzbekistan plans to completely switch to mechanized cotton picking. To implement these plans, the Cabinet of Ministers of the Republic will develop a preferential program for the sale of equipment on lease. The implementation of the project will begin in four regions: Tashkent, Jizzakh, Kashkadarya and Sirdarya. For farmers from these regions, the Ministry of Finance will cover the cost of technical equipment in the amount of 30%. From 2023, the mechanized method will be extended to the rest of the country [3].

Machine-picked raw cotton (especially under unfavorable weather conditions) has high humidity and contamination with green impurities, "which sharply complicates the tasks of the cotton ginning industry". On the one hand, it is necessary to ensure the

timely acceptance and safety of such raw materials arriving in a very short time, on the other hand, to build the technological process of the cotton plant so that its products meet all the requirements of consumers [3].

Analysis of the literature on the subject. Research organizations are working to improve the cleaning effect of raw cotton cleaners.

A number of combined cotton-cleaning units have been created, combining the cleaning of raw cotton simultaneously from small and large trash impurities. One of the variants of the cotton ginning unit (Fig. 1) was developed by scientists of the Central Scientific Research Institute of the Cotton Industry (CSRICI) [4].
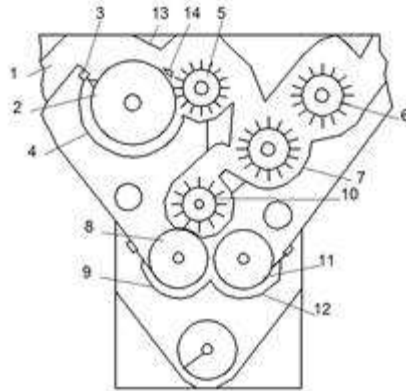

Figure 1. Unit for cleaning raw cotton, designed by CSRICI

These cleaners can be docked together to form raw cotton cleaning flow lines. The reason that this design has not received widespread use in industry is the complexity of its maintenance and prevention. In the course of further research, a combined axial cotton cleaner was created [5; -p.168].

This design of the combined cleaner (Fig. 2) also did not find widespread use, since it is rather cumbersome and frequent downhole situations (especially when processing wet raw cotton) did not allow its implementation at ginning plants.
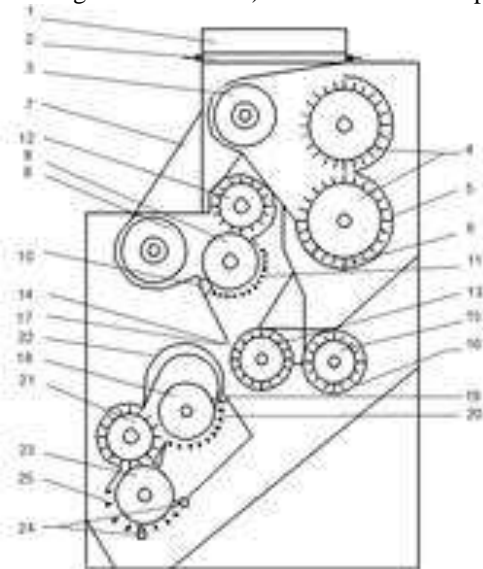

Figure 2 Schematic of an axial cotton cleaner

In the course of practical research, a cotton-cleaning unit has been developed [6, 7-p.72-77] with vertical sections for cleaning from fine and coarse litter, which consists of a feeder 1, under which, in the vertical plane, in the course of the process, a section for cleaning cotton from fine litter 2 with peg drums 3 and mesh surfaces 4, on which a litter visor 5 is installed.

Under the cleaning section 2 there is a section for cleaning cotton from coarse debris, containing a lapping brush 6, a main saw drum 7 with a grate 8 and a regeneration saw drum 9, a removable brush drum 10 and a weed auger 11. The cleaning sections are interconnected by a branch pipe through which the cotton is re-fed to the section for cleaning from small trash impurities 13. After cleaning from small trash impurities, cotton is fed through the unloading shaft 14 to the subsequent technological process of cotton processing (Fig. 3).
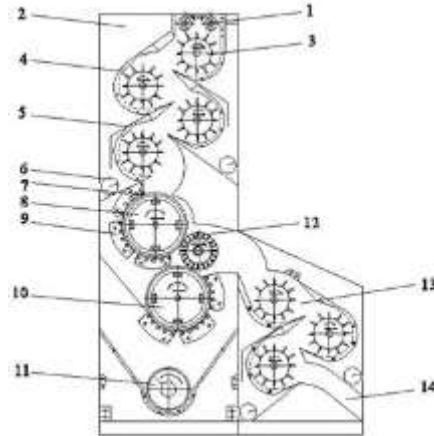
1 - feeder; 2 - section for cleaning cotton from fine litter; 3 - peg drum; 4 - mesh surface; 5 - visor for litter, 6 - weed auger: 7 - lapping brush; 8 - saw drum; 9 - grate; 10 - regeneration drum; 11 - weed auger; 12 - brush drum; 13 - section for cleaning cotton from small trash impurities; 14 - unloading shaft.

Figure 3. Diagram of a vertical ginning unit

In operation, cotton from feeder 1 is fed to the section for cleaning from fine litter 2, where it is cleaned on peg drums 3 with mesh surfaces 4. Installation of adjacent drums 4 with a displacement in the horizontal plane and the opposite direction of their rotation will increase the angle of coverage by the mesh surface 4 to 2100 the peeling drum 3, which will lead to a sharp increase in the cleaning effect, and the zigzag movement of the cotton flow will ensure high reliability of the unit in operation. At the same time, the guiding shield of the mesh surface in the cotton impact zone is made stepwise.

This eliminates the return of cotton during cleaning to the upper drum, prevents the bottom hole situation and ensures a uniform flow of the cleaning process. Further, cotton is fed through the branch pipe to the section for cleaning cotton from coarse litter, where the lapping brush 7 attaches the cotton to the saw drum 8 and when the cotton hits the grate 9, large trash impurities are released. The volatiles released into trash impurities are re-cleaned by the regeneration drum 10.

The unit can significantly reduce energy consumption in the process of cleaning raw cotton when cleaning high varieties.

However, this unit has significant drawbacks: it has a very complex design, several screws are used for waste together, only the cleaning of raw cotton from fine litter is enhanced. Therefore, the authors recommend using it only when cleaning high grades of cotton, we cannot call it a full-fledged cleaning unit, all the more impossible its use for cleaning machine-pick cotton with high contamination.

Research methodology. Determination of the quality of raw cotton machine collection is currently carried out by modern methods. The main indicators - moisture and contamination of raw cotton was determined using laboratory equipment VXS and paintwork materials [8]. When sampling cotton, the requirements of existing standards were met. [9, 10].

Analysis and results. We conducted studies of the effect of machine harvesting on the moisture and weediness of the harvested cotton, carried out in the 2020 season in the conditions of cotton growing farms in Dustlik district of Jizzakh region. Harvesting in the field was carried out in three options, with the opening of bolls 60%, 70% and 80% of the total number of bolls in cotton. The results of the data obtained are shown in Table 1.

Table 1

Influence of machine harvesting of cotton on the quality of harvested raw cotton

Indicators	S-6524		
	Productivity by types of collection, kg / ha	Moisture content of raw cotton,%	Infestation of raw cotton
1 option			
When opening 50-60%	25	9	13
With additional disclosure 20-30%	7	10,0	16,0
2 Option			
At 70% disclosure	27	10	12

With additional disclosure 20-25%	5	10	14
3 Option			
When opening 80% and above	29	10	11
With additional disclosure 10-15%	3	10	14

It was determined that raw cotton harvested by machines of all variants of experiments in terms of quality indicators corresponds to the third class of the first industrial grade (Table 1).

At the cotton ginning factories, currently, for the purification of raw cotton, a unit for purification of raw cotton, combined grade UXK, is used, which is designed to purify raw cotton of medium staple varieties from coarse and fine litter (Fig.4) [11].
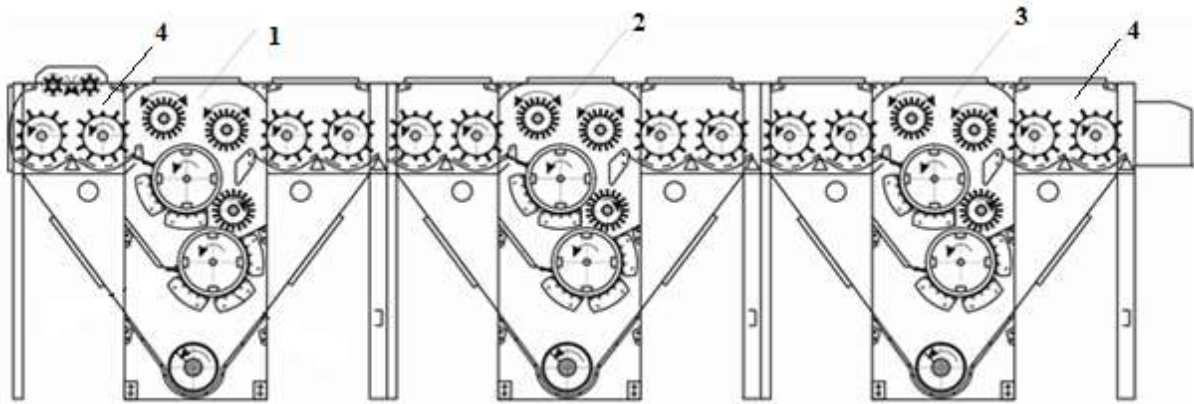
1-2-3-sections for cleaning cotton from large litter, 4- sections for cleaning cotton from small litter
Figure 4 Scheme of a cotton ginning unit UXK

Preliminary studies of the UKHC unit on machine harvesting in the Jizzakh region showed that they do not provide high-quality cleaning of cotton to obtain the highest grade fiber. In the research, we used machine-picked raw cotton of the 2020 season of the selection variety C-6524 of the first industrial grade with a moisture content of 10% and a weediness of 11%. When processing such cotton under the conditions of the Dustlik ginnery using the UXK unit for cleaning raw cotton, the average contamination of cleaned cotton (from the gin tray) was obtained in the range of 1.4-1.6%, which does not meet the requirements of the current technological regulations [12] In addition, it was determined that large litter remains in large quantities in the cleaned raw cotton. By weighing the cleaned cotton from the gin tray on a laboratory paintwork machine, it was found that large litter is in the range of 60-65%, and the rest belongs to small litter.

In conclusion. The analysis of the literature and preliminary studies made it possible to identify unresolved problems in the cleaning of machine-picked raw cotton with high contamination. Proceeding from this, we have chosen the direction of research to improve the cleaning unit of the UXK for cleaning cotton from machine collection, for example, increasing the frequency of cleaning cotton from large trash impurities.

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